

Original article

Postgraduate education to increase adherence to a Dutch physiotherapy practice guideline for hip and knee OA: a randomized controlled trial

Wilfred F. Peter^{1,2}, Philip J. van der Wees^{3,4,5}, John Verhoef⁶, Zuzana de Jong⁷, Leti van Bodegom-Vos⁸, Wim K. H. A. Hilberdink⁹, Marta Fiocco¹⁰ and Thea P. M. Vliet Vlieland¹

Abstract

Objective. To compare the effectiveness of two educational courses aiming to improve adherence to recommendations in a Dutch physiotherapy practice guideline for hip and knee OA.

Methods. Physiotherapists (PTs) from three regions in The Netherlands were invited to participate in a study comparing an interactive workshop (IW) with conventional education (CE). Participants were randomly assigned to one of the two courses. Satisfaction with the course (scale 0–10), knowledge (score range 0–76) and guideline adherence (score range 0–72) were measured at baseline, immediately after the educational course and 3 months after that. Data were analysed using a linear mixed model.

Results. In total, 203 (10%) PTs participated in the IW ($n = 108$) and the CE ($n = 95$). There were no differences between groups at baseline. Satisfaction was significantly higher in the IW than in the CE group [mean scores (s.d.) 7.5 (1.1) and 6.7 (1.6), respectively ($P < 0.001$)]. A significantly greater improvement in adherence was seen over time in the IW group compared with the CE group ($F = 3.763$, $P = 0.024$), whereas the difference in improvement of knowledge was not significant ($F = 1.283$, $P = 0.278$).

Conclusion. An IW led to greater satisfaction and was more effective in improving adherence to recommendations in a PT guideline on hip and knee OA than CE, whereas the increase in knowledge did not differ significantly.

Key words: implementation, guideline adherence, education, physiotherapy.

Introduction

For patients with OA, new strategies to optimize conservative and surgical treatment have been developed over the past years. The new insights are reflected in numerous

guidelines and recommendations on the management of OA, which were developed by various international and national scientific societies and health care organizations [1–7].

Although it is generally acknowledged that the introduction of guidelines and recommendations improves the quality of care, unsatisfying adherence to clinical guidelines has often been reported [8–12]. To improve adherence to guidelines, the use of active implementation strategies in addition to passive dissemination is recommended [8–11]. These active strategies can be aimed at the level of the professional (e.g. professional education), the organization (e.g. adaptation of working processes), the context (e.g. adequate funding) or the patient (e.g. patient information) [8].

With respect to active implementation strategies for guidelines aimed at the professional, the provision of educational courses is a common option [12]. In a Dutch

¹Department of Orthopaedics, Leiden University Medical Center (LUMC), Leiden, ²Reade Center of Rehabilitation and Rheumatology (formerly Jan van Breemen Institute), Amsterdam, ³Royal Dutch Society of Physical Therapy (KNGF), Amersfoort, IQ Healthcare, Nijmegen, ⁴CAPHRI Maastricht University, Maastricht, The Netherlands, ⁵Harvard Medical School, Boston, MA, USA, ⁶Faculty of Health, University of Applied Sciences, Leiden, ⁷Department of Rheumatology, LUMC, Leiden, ⁸Department of Medical Decision Making, LUMC, Leiden, ⁹Allied Health Care Center for Rheumatology and Rehabilitation, Groningen and ¹⁰Department of Medical Statistics and Bio information, LUMC, Leiden, The Netherlands.

Submitted 5 April 2012; revised version accepted 17 August 2012.

Correspondence to: Wilfred F. H. Peter, Leiden University Medical Center, Department of Orthopaedics, PO Box 9600, 2300 RC Leiden, The Netherlands. E-mail: w.f.h.peter@lumc.nl; w.peter@reade.nl

physiotherapy guideline on low back pain, an active implementation strategy showed more effectiveness than passive dissemination of the guideline [13, 14]. Evaluations of traditional presentations on physiotherapy guidelines showed that the attending physiotherapists (PTs) were satisfied overall, but preferred a more practical approach [12].

Using the 2010 revised version of the Dutch physiotherapy practice guideline for hip and knee OA (<https://www.kngfrichtlijnen.nl/654/KNGF-Guidelines-in-English.htm>) [15] as an example, the aim of the present study was to develop and compare two educational courses, i.e. an interactive course and a conventional presentation, with respect to their ability to improve satisfaction, knowledge and guideline adherence.

Methods

Study design

The study concerned a randomized controlled trial comparing two different educational courses for implementing the Dutch physiotherapy guideline for hip and knee OA [15] among PTs. A paper summary of the guideline was disseminated by regular mail among the members of the Royal Dutch Society for Physical Therapy [Koninklijk Nederlands Genootschap voor Fysiotherapie (KNGF)] in April 2010 and the complete guideline was made available on the Internet in June 2010 (<https://www.kngfrichtlijnen.nl/654/KNGF-Guidelines-in-English.htm>). Given the proven benefits of education, presentations on newly developed or updated guidelines are currently being organized by regional subdivisions of the KNGF in The Netherlands. These subdivisions organize educational courses for PTs on a monthly basis, and are, on average, attended by 10% of the members.

The study was performed in three regions in The Netherlands, from September 2010 to February 2011, and conducted in accordance with the Good Clinical Practices protocol and Declaration of Helsinki principles (<http://www.wma.net/e/policy/b3.htm>). According to Dutch law, formal approval from an ethics committee is not required for this kind of project. PTs gave their consent to participate in the study by e-mail. The execution of educational courses, processing and analyses of data were all performed by the principle investigator.

Recruitment of PTs

In three regions in The Netherlands [West (Amsterdam), North (Groningen) and South-East (Nuenen)], all PTs who were members of the KNGF and registered as working in primary or secondary care were invited to participate in the study via an online newsletter that they received by e-mail. In the invitation newsletter, the purpose and methods of the study and the general contents of the two educational courses were explained. The dates of the two courses were mentioned (same day of the week, 1 week in between), however it was not stated which type of course would be provided on which date. PTs were informed that they were eligible for the study if they (i) were

available on both dates, (ii) were the only PT from one practice or institution participating in the project to prevent contamination and (iii) were willing to fill in a questionnaire at three different time points. If PTs were not willing to participate, they were asked to provide the reason(s) why. All the invited PTs had the possibility to respond by e-mail.

Randomization

The randomization was carried out by members of the regional staff of the three subdivisions of the KNGF who were not involved in the educational courses or the study. First, all participants were listed and numbered after checking for double subscriptions from the same practice or institute. Then, by means of a random digit generator, each PT's number was assigned the number 1 [the interactive workshop (IW) group] or 2 [the conventional education (CE) group]. Subsequently the PT numbers and assigned interventions were connected to the PTs' personal data. In each region the CE was carried out on the first of the two assigned dates and the IW 1 week thereafter. The participating PTs were unaware of this assignment until the date of the training course was confirmed. Both educational courses were offered for free. The regional staff recoded the randomization codes 1 and 2 on the randomization list into A and B, with the principal investigator being unaware of which of the two interventions were related to A or B until the statistical analyses were finished.

Educational courses

The interventions comprised two educational courses that were developed by an expert PT, pilot-tested among 10 PTs and adapted according to their comments. The expert PT had >10 years experience in treating patients with hip and knee OA, followed advanced training courses concerning OA and was experienced in teaching professionals.

IW

The same expert PT was guiding the IWs in all three regions. Each workshop was carried out with the help of three or four patients with hip and/or knee OA and three or four PT teachers. The teaching PTs were required to treat patients with hip and knee OA every week and be familiar with the revised guideline. They were working in the same region where the IW took place and received 1.5 h instructions about the content of the workshop. They learned how to guide the participants in the process of clinical reasoning, received oral and written instruction and had to study the content of the guideline thoroughly.

The workshop started with a short summary of guideline recommendations. Subsequently the participants were divided in subgroups of 8–10 PTs. The patient presented his or her complaints and their consequences for daily activities and participation. More information was gathered by interviewing. Within each subgroup decisions were made concerning initial assessment, treatment modalities and the measurement instrument to be used, based

on clinical reasoning. PTs and patients taking part in the educational course could provide feedback concerning all the decisions made. During this process the expert PT was available to give additional feedback. In a plenary session, the IW ended with a discussion about a fictional case and questions concerning the content of the guideline. The IW workshop lasted three hours.

CE

The CE intervention was provided by the same expert PT in all three regions. It comprised a presentation about the guideline developmental process and the recommendations in the guideline. Two different cases were presented to the group (one patient with hip OA and one with knee OA) and their initial assessment, treatment and the evaluation of treatment by means of measurement instruments were described, all according to the guideline. The educational course lasted two hours.

Evaluation

The evaluation included online questionnaires among PTs participating in the educational courses. All participating PTs were sent a hyperlink to an electronic questionnaire by e-mail before the educational course (T0), immediately afterwards (T1) and 3 months thereafter (T2). Information was gathered concerning age, sex, work setting, years of physiotherapy experience, the number of patients with hip and/or knee OA treated during the last 3 months and previous participation in educational courses concerning arthritis. To obtain optimal responses for the second and third time points, two reminders were sent by e-mail after 3 and 5 weeks to those who did not respond. If the three required questionnaires were completed, the participant received accreditation from the KNGF for the educational course (four continuing education points).

The questionnaires consisted of measures of satisfaction with the educational course, knowledge on hip and knee OA and its treatment and self-reported adherence to the guideline. According to the Kirkpatrick model of training evaluation [16, 17], which was applied to the evaluation retrospectively, these outcome measures address three of four levels of training evaluation. The four levels of Kirkpatrick's evaluation model essentially measure (i) reaction of students—what they thought and felt about the training; (ii) learning—the resulting increase in knowledge or capability; (iii) behaviour—extent of behaviour and capability improvement and implementation/application and (iv) results—the effects on the business or environment resulting from the trainee's performance. With the application of this model, the measurement of satisfaction is in accordance with the reaction level, the measurement of knowledge with the learning level and the measurement of self-reported adherence to the guideline with the behaviour level. Due to limited time and financial resources, the fourth results level could not be studied within the scope of the project.

Satisfaction

A self-developed satisfaction survey was administered once, directly after the course. It included three questions,

all rated on a point scale of 0–10 (higher score means more satisfaction): (i) How do you rate the content of the educational course? (ii) How do you rate the gained knowledge? (iii) How do you rate the applicability of the educational course to your daily practice?

Knowledge

Knowledge was measured using a self-developed knowledge questionnaire with 19 questions that were directly derived from the guideline. Ten items concerned theoretical knowledge (seven on initial assessment, one on treatment and two on evaluation). An example question was Which of the following items are specific red flags in patients with knee OA? There were six answer options, of which two were correct. The other nine items concerned practical knowledge of recommended physiotherapy care in daily clinical practice (three on initial assessment, three on treatment and three on evaluation). For the question concerning treatment, a case was described and three possible treatment strategies were presented. The question was formulated as follows: Which of the following treatment strategies would be optimal?—with only one of the strategies best fitting the recommendations in the guideline. The knowledge questionnaire comprised multiple choice and multiple response questions. In the case of a multiple choice question, a correct answer yielded 4 points. In a multiple response question, the score range depended on the number of correct answers: 4 points in the case of the maximum of three correct answers, 2 points in the case of two correct answers and 1 point for one correct answer. This yielded a total score range of 0–76, with a higher score indicating more knowledge.

Adherence

The participants were given a questionnaire concerning adherence to the recommendations in the updated KNGF guideline on hip and knee OA: Quality Indicators for Physical Therapy in Hip and Knee Osteoarthritis (QIP-HKOA) [18]. This questionnaire contained 18 process indicators and was developed according to a similar procedure followed by Nijkrake *et al.* [19] in the evaluation of adherence to recommendations in the guideline for Parkinson's disease. The QIP-HKOA was found to have good face and content validity in a previous study among 185 PTs [18]. The 18 items were scored using a 5-point Likert scale: 0 = never; 1 = seldom; 2 = sometimes; 3 = generally; and 4 = always. The total score range was 0–72, with a higher score meaning greater adherence to recommendations.

Statistical analysis

Socio-demographic characteristics of the participants in the study are presented in Table 1. The baseline characteristics and PT satisfaction scores were compared between the two intervention groups by means of unpaired *t*-tests, Mann–Whitney U-tests or χ^2 -tests, where appropriate.

A linear mixed model was employed to evaluate the effect of IW and CE on the improvement concerning guideline adherence and knowledge. The interaction

TABLE 1 Baseline characteristics of PTs participating in IW and CE

PT characteristics	CE (<i>n</i> = 95)	IW (<i>n</i> = 108)	<i>P</i> *
Age, mean (SD), years	42.8 (12.8)	43.9 (11.1)	0.75
Gender, females, <i>n</i> (%)	68 (71.6)	74 (68.5)	0.64
Work setting, <i>n</i> (%)			
Primary care	75 (78.9)	85 (78.7)	0.97
Hospital/rehabilitation centre/nursing home	20 (21.1)	23 (21.3)	
Experience, <i>n</i> (%)			
0–10 years	30 (31.6)	34 (31.5)	0.99
>10 years	66 (68.4)	74 (68.5)	
OA patients treated in the last 3 months, <i>n</i> (%)			
0–10	87 (91.6)	104 (96.3)	0.16
>10 years	8 (8.4)	4 (3.7)	
Education in OA, yes, <i>n</i> (%)	23 (24.2)	27 (25.0)	0.90

*Student's *t*-test or χ^2 -test as appropriate.

between time and the nature of the educational course (i.e. IW and CE) was tested in order to examine changes of the effect over time. All data were analysed using the SPSS statistical package (version 18.0, SPSS, Chicago, IL, USA). The level of statistical significance was set at $P=0.05$ for all analyses.

Results

Response and drop-outs

Fig. 1 shows the recruitment of PTs and randomization. In total, 4357 PTs working in 2059 primary practices or institutes in the three regions of The Netherlands were invited. Two hundred and forty-eight (12%) of them met the three predetermined criteria and subscribed to the study.

Forty-five of the 248 PTs did not show up at the educational course (16 in the workshop group and 29 in the conventional group) without giving notice. Of the remaining 203 PTs, 184 completed all the questionnaires at the three time points. The statistical analyses were performed using all the data available from 203 participants. Eighty-four PTs responded to the question of why they did not want to participate (Fig. 1).

Baseline characteristics of participating PTs

At baseline there were no differences in characteristics between PTs who attended the IW and PTs who attended the CE (Table 1).

Satisfaction

With respect to PT satisfaction, the mean scores (total score range 0–10) were statistically and significantly higher in the IW group compared with the conventional group: increase in knowledge 7.1 (s.d. 1.4) vs 6.1 (s.d. 1.9), content of the educational course 7.4 (s.d. 1.0) vs

6.8 (s.d. 1.6) and expected applicability for daily clinical practice 7.9 (s.d. 0.8) vs 7.1 (s.d. 1.4), respectively (all P -values < 0.005).

Knowledge

The mean knowledge score increased after the educational course at T1 in both groups, but decreased slightly between T1 and T2 (Table 2 and Fig. 2). Results from the linear mixed model showed a slightly greater change of the knowledge score in the IW group compared with the CE course group, with the difference persisting over time; however, the difference was not statistically significant ($P=0.278$).

Adherence to process indicators (QIP-HKOA)

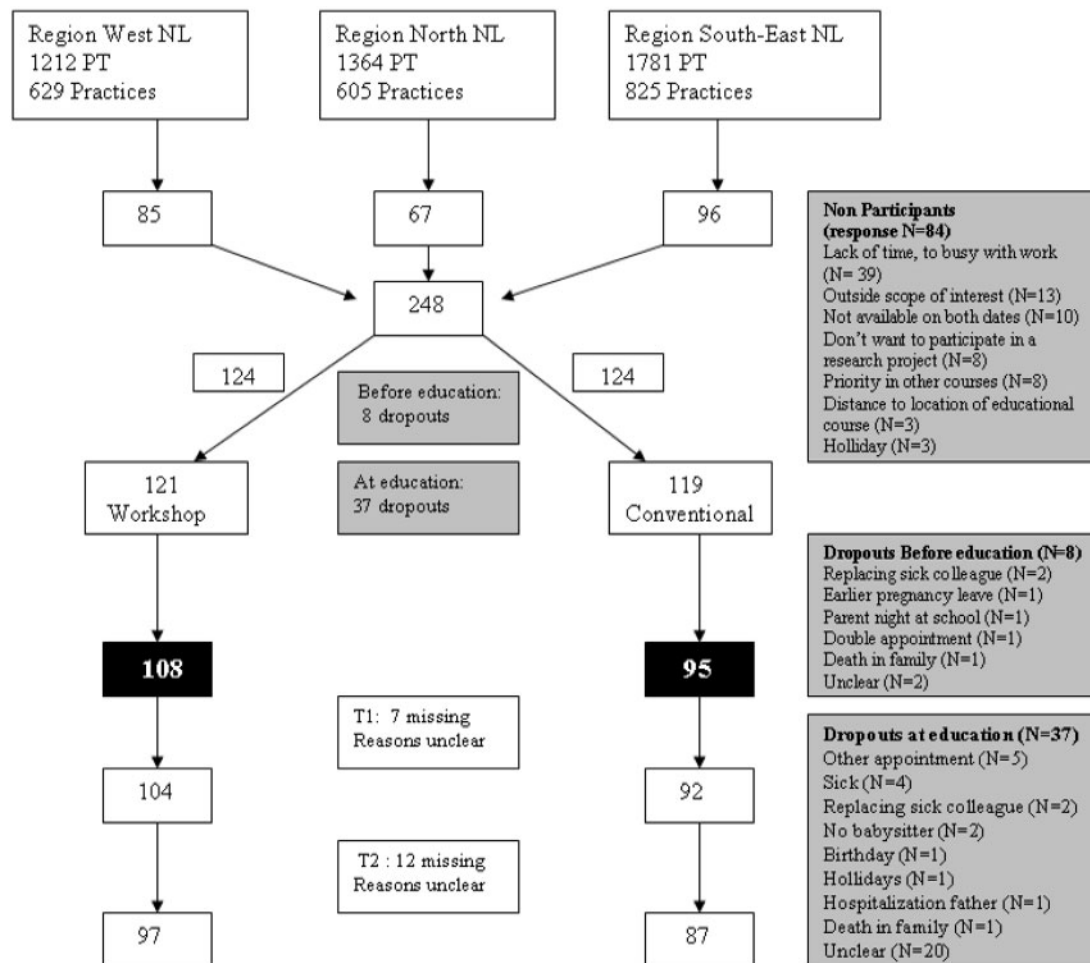
Table 2 and Fig. 3 show that in both groups the mean adherence score improved between baseline and directly after the educational course at T1, as well as between T1 and T2. Taking into account all time points, a statistically significantly greater improvement of the adherence score over time for the IW group compared with the CE course group was seen ($P=0.024$).

Discussion

This study showed that an IW with the cooperation of patients and following a process of clinical reasoning was more effective with respect to satisfaction and with improving self-reported adherence to recommendations in a Dutch physiotherapy guideline on hip and knee OA than a CE course. No difference in increase of knowledge was seen between the two groups.

The results of the present study are in line with a similar randomized, controlled study on the implementation of the Dutch physiotherapy guideline for low back pain among 113 PTs. The study showed that after an interactive educational approach, PTs more often followed guideline recommendations than with dissemination alone [14]. Working according to the guideline implied that they limited the number of treatment sessions in patients with a normal course of back pain, set functional treatment goals, used mainly active interventions and gave adequate patient education [14]. Our results were also comparable with those of a randomized controlled study on the implementation of an Australian physiotherapy guideline concerning whiplash [20]. In that study, education including an interactive and practical session with problem solving followed by an educational visit after 6 months showed more effectiveness than guideline dissemination alone. Direct comparisons of magnitude effects seen in previous studies and the present one are difficult to make, as different outcome measures were used. In both previous studies, audits of PTs' records were used to determine the effect.

The significant effect seen in the present study is nevertheless remarkable, as the contrast between intervention and control was smaller than in the two previous studies. In both previous studies, PTs in the control group only received the guideline, whereas in the present

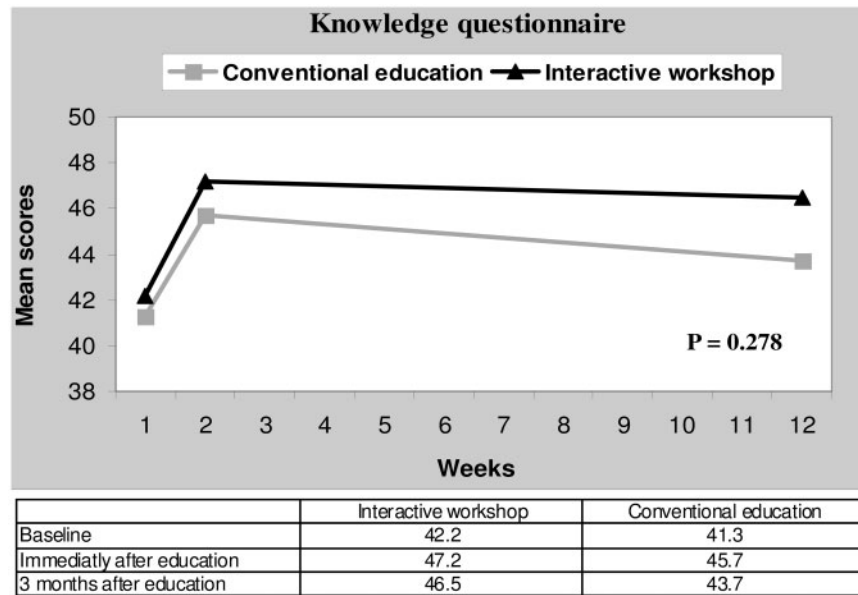
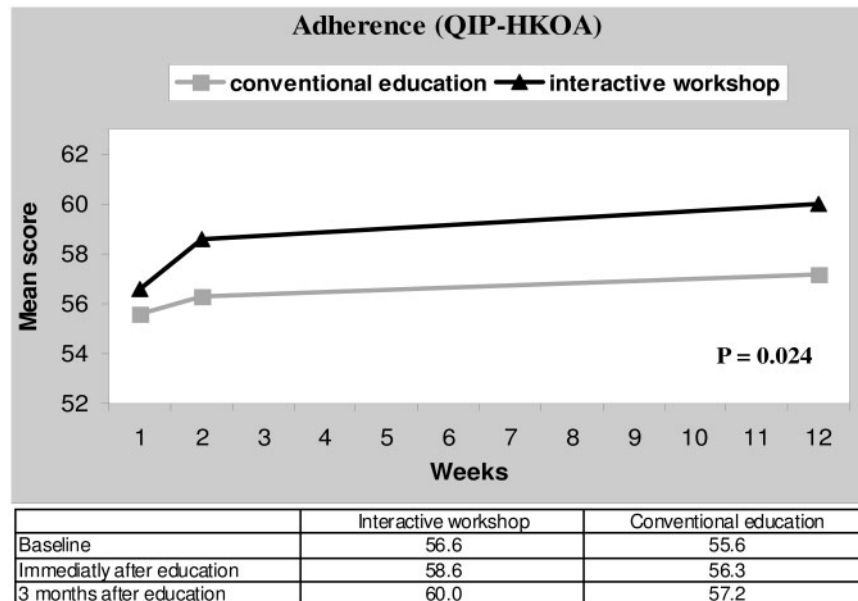
Fig. 1 Recruitment and randomization.**TABLE 2** Mean (change) scores and CI outcome measures for IW and CE

Outcome measures	Mean T0 (95% CI)	Mean T1 (95% CI)	Mean change T0-T1 (95% CI)	Mean T2 (95% CI)	Mean change T1-T2 (95% CI)	P
QIP-HKOA (total score range 0–72)						
IW	56.6 (55.4, 57.8)	58.6 (57.3, 59.8)	2.0 (1.1, 2.9)	60.0 (58.7, 61.3)	1.4 (0.6, 2.2)	0.024*
CE	55.6 (54.3, 57.0)	56.3 (54.9, 57.6)	0.7 (–0.3, 1.7)	57.2 (55.8, 58.5)	0.9 (–0.1, 2.1)	
Knowledge questionnaire (total score range 0–76)						
IW	42.2 (40.6, 43.8)	47.2 (45.6, 48.9)	5.0 (3.4, 6.6)	46.5 (44.8, 48.2)	–0.7 (–2.4, 0.3)	0.278
CE	41.3 (39.5, 43.0)	45.7 (43.9, 47.5)	4.4 (2.6, 6.1)	43.7 (41.9, 45.5)	–2.0 (–4.1, 0.3)	

*Statistically significant difference over time according to a linear mixed model analysis.

study the control group received a control intervention consisting of a presentation about the developmental process and the content of the guideline. Moreover, in both previous studies the interactive interventions were

more intensive than in the present study, as their duration was longer. In addition, the previous studies did not include patients as partners in the educational interventions. Patient participation was found to have a positive effect

Fig. 2 Mean score of knowledge questionnaire over time.**Fig. 3** Mean score of adherence questionnaire (QIP-HKOA) over time.

on medical student learning in several studies [21, 22], and could have added value in improving physical examination skills [23].

How an educational course should best be provided is also dependent on PTs' preferences. Greater satisfaction with an interactive approach as in the present study could improve participation in educational courses concerning guidelines and therefore probably increase adherence.

Regarding the evaluation of educational courses, there are various theoretical frameworks available [16, 17, 24, 25]. Barr *et al.* [24] described a framework using the Kirkpatrick model as a basis, yet adding modifications of perceptions and attitudes to the learning level and changes in organizational practice and benefits to patients/clients to the results level. Moore *et al.* [25] proposed a model with six levels of educational outcomes, including participation, satisfaction, learning,

performance, patient health and community health. Given the limited scope of the present study, the Kirkpatrick's model [16, 17] matched the outcome measures best.

This study has a number of limitations. First, only 10% of potentially eligible PTs participated in the study, so selection bias cannot be excluded. Therefore the results cannot be generalized to PTs who did not participate in this study. Apart from a limited number of responses from non-participants, it is largely unknown which barriers played a role in deciding whether or not to take part in the study, such as lack of time or interest, and preference for other modes of delivery, such as online courses. With respect to alternative modes of delivery such as online courses or gaming, more research is needed. In a comparative evaluation of teaching methods for physiotherapy students by Willet *et al.* [26] it was found that lecture-based instruction was more effective than computer-based instruction, but with the latter the students spent less time studying. In general, more research on implementation strategies trying to reach PTs who do not participate in educational courses on guidelines is needed. A limitation concerning the intervention was that one expert PT was involved in both forms of education, so that a spill-over effect cannot be totally excluded. Moreover, the duration of the two interventions was not exactly the same. In addition, the use of different PT teachers and patients and the different locations could have led to bias, despite the use of a strict protocol and extensive preparation. With respect to the evaluation, all the questionnaires were self-developed and were only to a limited extent tested regarding their clinimetric properties. Another limitation concerning the evaluation was the omission of the fourth level of the Kirkpatrick model of training evaluation, concerning the effect at the level of the PT's workplace and organization. To measure that effect a longer time frame would have been needed that would also have allowed determination of long-term effects regarding knowledge retention and guideline adherence. In addition, this would have required additional evaluations, such as measurement of the actual performance of PTs by chart review, measurement of outcomes at patient level or measurement of organizational changes at the PTs' practice level. Finally, although blinded for group assignment during the analyses and supervision of all analyses by a statistician, the principal investigator conducted both interventions and analyses.

Apart from all the above-mentioned limitations, it should be noted that education is only one possible strategy as part of the total implementation of guidelines, and, moreover, the focus of this study was only at the professional level. As indicated by Grol and Grimshaw [8], problems in implementation can arise at different levels in the health care system: at the level of the patient, the individual professional, the health care team, the health care organization or the wider environment. Other implementation strategies targeted at those levels could have had an additional effect.

In conclusion, an IW with the cooperation of patients and following a process of clinical reasoning was found to be more effective in the implementation of a physiotherapy guideline than CE. The results of the present study indicate that an interactive approach is a promising educational strategy to enhance the uptake of PT guidelines. To roll out an IW on a larger scale, a number of aspects need to be considered. First, patients and tutors are needed, requiring resources for their recruitment and training as well as payment for their activities in the course. Secondly, the relatively long duration of the course (3 h) increases the costs of renting a course venue and of catering. To compensate for the costs, the institution of a fee for attending PTs could be considered. We estimate that this fee would be relatively low, and therefore not likely to have a negative impact on the number of physical therapists willing to take part in the educational course. Implementation on a larger scale should be evaluated systematically, with respect to both the participation of PTs and its impact on the practice setting, patients and community. With these considerations taken into account, the authors would recommend the interactive educational approach be used by others as part of their implementation strategy concerning guidelines.

Rheumatology key message

- Interactive education is an effective strategy for implementing a Dutch physiotherapy guideline in OA.

Acknowledgements

We would like to thank the following physiotherapists for their participation in the IWs: A. Brekelmans, R. G. Dilling, W. K. H. A. Hilberdink, J. van den Hoek, S. van de Kamp, J. Knoop, F. Laumen, N. van Lierop, B. Reefkamp, M. de Rooij, R. Veldink, G. Veldkamp and F. Wagenaar.

Funding: This work was supported by the Royal Dutch Society of Physical Therapy (KNGF; project number 30724) and the Dutch Arthritis Association (Reumafonds; project number BP 10-1-161).

Disclosure statement: The authors have declared no conflicts of interest.

References

- 1 Jordan KM, Arden NK, Doherty M *et al.* EULAR recommendations 2003: an evidence based approach to the management of knee osteoarthritis: report of a task force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). *Ann Rheum Dis* 2003;62:1145-55.
- 2 Zhang W, Doherty M, Arden N *et al.* EULAR evidence based recommendations for the management of hip osteoarthritis: report of a task force of the EULAR Standing Committee for International Clinical Studies Including Therapeutics (ESCISIT). *Ann Rheum Dis* 2005; 64:669-81.

- 3 Zhang W, Moskowitz RW, Nuki G *et al.* OARSI recommendations for the management of hip and knee osteoarthritis, part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage* 2008;16:137–62.
- 4 Roddy E, Doherty M. Guidelines for management of osteoarthritis published by the American College of Rheumatology and the European League Against Rheumatism: why are they so different? *Rheum Dis Clin North Am* 2003;29:717–31.
- 5 Roddy E, Zhang W, Doherty M *et al.* Evidence-based recommendations for the role of exercise in the management of osteoarthritis of the hip or knee—the MOVE consensus. *Rheumatology* 2005;44:67–73.
- 6 Zhang W, Doherty M, Leeb BF *et al.* EULAR evidence-based recommendations for the diagnosis of hand osteoarthritis: report of a task force of ESCISIT. *Ann Rheum Dis* 2009;68:8–17.
- 7 CBO. Richtlijn Diagnostiek en Behandeling van heup- en knie artrose. <http://www.cbo.nl/thema/Richtlijnen/Overzicht-richtlijnen/Bewegingsapparaat/>, 2007.
- 8 Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet* 2003;362:1225–30.
- 9 Grimshaw JM, Thomas RE, MacLennan G *et al.* Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess* 2004;8:iii–iv, 1–72.
- 10 Harting J, Rutten GM, Rutten ST, Kremers SP. A qualitative application of the diffusion of innovations theory to examine determinants of guideline adherence among physical therapists. *Phys Ther* 2009;89:221–32.
- 11 Bero LA, Grilli R, Grimshaw JM *et al.* Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. The Cochrane Effective Practice and Organization of Care Review Group. *BMJ* 1998;317:465–8.
- 12 Fleuren MAH, Jans MP, van Hespen ATH. Basisvoorwaarden voor de implementatie van de KNGF-richtlijnen. Report no. TNO-rapport KvL/B&G 2007.139, 2007.
- 13 Bekkering GE, van Tulder MW, Hendriks EJ *et al.* Implementation of clinical guidelines on physical therapy for patients with low back pain: randomized trial comparing patient outcomes after a standard and active implementation strategy. *Phys Ther* 2005;85:544–55.
- 14 Bekkering GE, Hendriks HJ, van Tulder MW *et al.* Effect on the process of care of an active strategy to implement clinical guidelines on physiotherapy for low back pain: a cluster randomised controlled trial. *Qual Saf Health Care* 2005;14:107–12.
- 15 Peter WF, Jansen MJ, Hurkmans EJ *et al.* Physiotherapy in hip and knee osteoarthritis: development of a practice guideline concerning initial assessment, treatment and evaluation. *Acta Reumatol Port* 2011;36:268–81.
- 16 Kirkpatrick D. Evaluation of training. In: Craig R, Bittel I, eds. *Training and development handbook*. New York: McGraw-Hill, 1967.
- 17 Kirkpatrick JD. Implementing the four levels: a practical guide for effective evaluation of training programs. San Francisco: Berret-Koehler, 2007.
- 18 Peter WF, van der Wees PH, Verhoef J *et al.* Development of quality indicators for physical therapy in hip and knee osteoarthritis. *Arthritis Rheum* 2011;63.
- 19 Nijkrake MJ, Keus SH, Ewalds H *et al.* Quality indicators for physiotherapy in Parkinson's disease. *Eur J Phys Rehabil Med* 2009;45:239–45.
- 20 Rebbeck T, Maher CG, Refshauge KM. Evaluating two implementation strategies for whiplash guidelines in physiotherapy: a cluster-randomised trial. *Aust J Physiother* 2006;52:165–74.
- 21 Haq I, Fuller J, Dacre J. The use of patient partners with back pain to teach undergraduate medical students. *Rheumatology* 2006;45:430–4.
- 22 Raj N, Badcock LJ, Brown GA, Deighton CM, O'Reilly SC. Undergraduate musculoskeletal examination teaching by trained patient educators—a comparison with doctor-led teaching. *Rheumatology* 2006;45:1404–8.
- 23 Oswald AE, Bell MJ, Wiseman J, Snell L. The impact of trained patient educators on musculoskeletal clinical skills attainment in preclerkship medical students. *BMC Med Educ* 2011;11:6.
- 24 Barr H, Koppel I, Reeves S, Hammick M, Freeth D. *Effective inter professional education: argument, assumption & evidence*. Oxford: Blackwell, 2005.
- 25 Moore DE Jr, Green JS, Gallis HA. Achieving desired results and improved outcomes: integrating planning and assessment throughout learning activities. *J Contin Educ Health Prof* 2009;29:1–15.
- 26 Willet GM, Graham Sharp A, Smith LM. Comparative evaluation of teaching methods in an introductory neuroscience course for physical therapy students. *J Allied Health* 2008;37:e177–98.